Title 15 - Mississippi State Department of Health

Part III – Office of Health Protection

Subpart 77 – On-site Wastewater

APPENDIX 04 DESIGN STANDARD: SUBSURFACE DRIP IRRIGATION

100 INTRODUCTION

Subsurface Drip Irrigation is a system that utilizes 3 basic design principles. They are (1) uniform distribution of effluent, (2) dosing and resting cycles and (3) shallow placement of tubing. This system uses small diameter pipe with emitters and must be preceded by a treatment system that conforms to the manufacturer's specifications particular to that system. The effluent must be adequately filtered before distribution to the disposal field(s). Only Subsurface Drip Irrigation Systems that provide for **timed dosing** are acceptable. The term manufacturer, unless otherwise specified, is considered the manufacturer of the treatment device. (Figure I)

101 DEFINITIONS

101.01 Advanced Treatment System – an Individual On-site Wastewater treatment system that complies with Section 41-67-10. **MS Code of 1972, Annotated 41-67-2(a)**

101.02 Components – all physical, mechanical, and electrical components of any wastewater disposal system.

101.03 Distribution manifold – pvc pipe that delivers the treated effluent to the drip tubing.

101.04 Emitter – small labyrinth inside of drip tubing that eliminates pressure and releases drops of treated effluent.

101.05 Maintenance – the inspecting and evaluating of an Alternative System or Advanced Treatment System. The replacement of any component registered with a specific Advanced Treatment System (i.e., aerator, diffuser, control panel, etc.).

101.06 Subsurface Drip Irrigation System – a system that relies on advanced treatment and filtration of the treated effluent. Final disposal occurs in the upper limits of the soil horizon and is distributed through small diameter tubes that have emitters that slowly drip the treated water into the soil.

101.07 Tubing – a small diameter line made of a material that forms a tube which contains emitter and manufacturer’s fittings.

101.08 Vacuum breakers/air release valve – relieves pressure off the treated effluent and allows air to escape the system without causing damage.

102 DESIGN

Utilizing USDA soil groups as classified by textures is the most appropriate criteria on which to base loading rates for this system. The size of the disposal field shall be based on the most restrictive soil, naturally occurring within 2 feet of the ground surface or to a depth of 1 foot below the trench bottom, whichever is deeper. Criteria and techniques for soil and site evaluation can be found in Chapter 03 Regulation Governing Residential On-site Wastewater Disposal Systems: Soil and Site Evaluation.

102.01 Prior to the design of the Subsurface Drip Irrigation System, the suitability of the site must be demonstrated through acceptable soil permeability rates, acceptable soil conditions (Table I) and other topographic characteristics. The design and construction of the Subsurface Drip Irrigation System must conform to the drip tubing manufacturer's specification (Figure 1).

102.02 A minimum of 6 inches of naturally occurring soil must be present above a restrictive horizon or a predominantly gray soil (>50%) before placement of appropriate fill. Subsurface Irrigation System is not recommendable on hydric soils conditions.

102.03 Except where hydric soils are present, a clean fill material may be used to overcome seasonal water table limitation. The fill material shall consist of a minimum of 50 percent sand particles equal to or greater than 0.25 *mm*. Clay content shall be 20 percent or less. Organic matter shall be removed from the native soil surface prior to placing and incorporating the fill. This fill must be incorporated into the native soil to prevent a textural interface from developing. When fill material is used the entire fill area must be sodded to prevent erosion, or other effective erosion control methods used. The full depth of fill material must extend at least 2 feet in all directions from drip tubing and at that point shall be sloped at a grade of no steeper than 3 to 1.

102.04 In soils that contain a restrictive horizon, within 5 feet of the surface, there shall be a minimum of 12 inches of unsaturated soil between the bottom of the drip tubing and any perched or seasonal water table.

102.05 In soils that do not contain a restrictive horizon, within 5 feet of the surface, there shall be a minimum of 24 inches of unsaturated soil between the bottom of the drip tubing and any perched or seasonal water table.

102.06 Drip tubing must be installed a minimum of 6 inches deep. The maximum depth may not exceed 18 inches. In all cases there shall be a minimum of 12 inches separation between the water table and restrictive horizon.

102.07 Minimum separation between drip emitter shall be 2 feet. A 2 foot horizontal separation must be between drip tubing lines for slopes of less that 20 percent

for slopes of 20 percent or greater shall be a minimum of 3 foot horizontal separation.

102.08 Drip tubing shall either be placed 4 inches lower than the supply manifolds or water breaks shall be used to prevent effluent from flowing along the drip tubing to the supply manifold trenches.

102.09 Valves, fittings, level control switches and all other components must be designed and manufactured to resist the corrosive effects of wastewater and common household chemicals.

102.10 Electrical equipment shall be protected with safety devices (overload interrupting devices, fuses, etc.). Electrical equipment shall comply with appropriate *National Electrical Manufacturer's Association (NEMA)* requirements. Electrical component parts shall be covered by the manufacturer's limited warranty.

103 LOCATION/SETBACKS

103.01 All components of the Subsurface Drip Irrigation System shall be located a minimum of:

1. Water Supply (Public/Private)

    a. 100 feet from any public, private or individual potable water sources, unless protected by topographic features.

    b. 50 feet from any public, private or individual potable water source for all vessel(s) holding wastewater.

2. Water Supply Components

    a. 10 feet horizontal separation from any potable water line.

    b. 10 feet horizontal separation from any water meter.

    c. Potable water lines must not pass under or through any part of the wastewater disposal system which includes the collection and distribution of the wastewater or effluent.

3. Sensitive Waters

    a. 100 feet on slopes of greater than 8 percent

    b. slopes of less than or equal to 8 percent (Table I)

4. Property Lines

    a. 10 feet down slope or same grade

b. 10 feet up slope.

5. Residence and Buildings

a. 5 feet from habitable and non-habitable

6. Additional Structures

a. 5 feet from porches, patios, decks, walkways, driveways and parking areas

b. 25 feet from swimming pools

103.02 No vehicular traffic or parking is allowed in the area of the treatment and disposal system.

103.03 Advanced treatment, pump chamber, and Subsurface Drip Irrigation field shall not be located under dwellings or other permanent structures.

103.04 Disposal shall not be located in depressed areas where surface water will accumulate. Provision shall be made to minimize the flow of surface water.

103.05 Where all or part of the treatment and disposal system is proposed to be installed on property other than the owner's, a deeded easement in perpetuity shall be legally recorded in the appropriate county. The deeded easement shall be obtained to include a sufficient area to permit access, construction and maintenance.

103.06 Deeded easements or right-of-way areas for utilities, surface or subsurface drainage, roads, streets, ponds or lakes shall not be used as available space for location of a Subsurface Drip Irrigation System.

103.07 Drip Tubing shall be on contour and shall not be installed perpendicular (or up and down, etc.) to the slope. Elevation differences in a line or the entire grid shall not exceed the drip tubing manufacturers' specifications.

104 TREATMENT

104.01 Wastewater effluent must meet the requirement established by *American National Standards Institute/National Sanitation Foundation* (*ANSI/NSF) International Standard Number 40* testing protocol, as set forth in Regulations Governing Residential Individual Onsite Wastewater Disposal Systems: Certification. The type of treatment must also conform to drip tubing manufacturers' specifications.

104.02 The treatment and dosing chamber shall be designed, constructed and installed so all joints, seams, and component parts shall preclude infiltration of groundwater, and prevent escape of wastewater or liquids.

105 **DISTRIBUTION**

105.01 Drip Tubing

1. The drip tubing may be installed using any of the following methods:

   a. Excavation by a trenching machine.

   b. Approved plowing method as determined by the tubing manufacturer. The insertion tool must be of the type that does not pull or stretch the drip line during insertion. The use of "cable plows" or any type insertion method that employs pulling the drip line through the plowed trench is prohibited.

2. To insure equal dosing of the field there can be no more than a 10 percent variance in the flow between any 2 emitters in the entire field.

3. The length of each distribution line shall not exceed drip tubing manufacturer's specifications to insure equal distribution to each emitter.

4. If necessary, pressure compensating devices or regulators shall ensure equal distribution from all emitters at +/- 10% of the designed discharge rate.

5. Emitter outlet orifices are non-directional device.

105.02 Pump Chambers

1. During normal operating procedures the inlet to the treatment system shall not become surcharged.

2. The pump chamber shall have a minimum capacity of 1.5 times the estimated daily flow.

3. The pump chamber shall be equipped with an audible high water alarm, and may utilize a functional self-opening relief valve.

4. The pump chamber shall have a grade level access allowing a minimum of 17 inch diameter or 15 inch square, to allow servicing and/or removal of the largest component in the chamber. Access ports shall be protected against unauthorized entrance or removal, by use of tamper proof fasteners or a lid weighing 65 pounds or more.

5. The pump chamber shall be vented through the grade level access or by means of a separate vent. In either case, the vent shall be a minimum of 1 inch in diameter.

6. The pump chamber shall be made of material resistant to the corrosive effects of wastewater and designed to withstand the lateral and bearing loads to which it is expected to be subjected.

7. All openings shall be sealed with mastic, butyl rubber or other pliable sealant that is waterproof, corrosion resistant and approved for use in contact with wastewater, in a manner to prevent the entrance of surface and groundwater.

8. The high water alarm must be set as to allow a reserve capacity equal to ½ day estimated flow.

105.03 Minimum Pump Specifications

1. The pumping system shall be capable of dosing the disposal field a minimum of 6 equally spaced doses per 24 hour period. Each dose volume shall not exceed the estimated maximum daily flow divided by the number of dosing cycles. It is acceptable that daily usage of less than the design flow rate will result in a diminished number of cycles. An emergency override float is required to accommodate conditions which exceed the normal daily flow rate. (Table III).

2. The pumping system shall be designed to discharge the required volume of wastewater within the pressure range specified by all component manufacturers.

3. The pump shall be equipped with a low water cutoff to prevent damage to the pump during low water conditions in the pump chamber.

4. The pump shall be constructed of corrosion resistant materials suitable for effluent pumping.

5. The pump shall be sized per pump and components manufacturers' specifications to meet or exceed the hydraulic requirement of the system.

6. The pump shall be installed as not to violate the pump warranty.

7. The suction and pressure lines shall be Schedule 40 or equal and be sized to meet or exceed the hydraulic requirements of the system.

105.04 Minimum Filter Specifications

1. The filter shall filter effluent to prevent clogging to the specifications of the drip tubing manufacturer.

2. The filter shall achieve the required filtration at a rate equal to or greater than the peak discharge rate, including filter and/or system backwash.

3. An independent third party, acceptable to the Division, shall certify the filter performance. Verification from a manufacturer of filters or by an independent registered Professional Engineer.

4. The filter shall be made of material resistant to the corrosive effects of wastewater and common household chemicals.

5. The filter shall be readily accessible for inspection, service and/or maintenance.

6. The filter flush volume and velocity shall be per filter manufacturer's specifications.

7. The filter residue shall be returned to the treatment system.

8. The Subsurface Drip Irrigation System must provide an automatic field flush to prevent the build-up of solids in the distribution system, with its discharge returning to the treatment system and be capable of achieving a flushing velocity of a minimum of 1 foot per second. The return line must be permanently installed as a component of the system. A hose bib shall be prohibited as a component.

105.05 Component Specifications

1. Vacuum breakers shall be installed as per drip tubing manufacturer's specification, a minimum of 1 vacuum breaker/air release valve for each drip field zone.

2. Vacuum breakers shall be located in a protective enclosure that will prevent the accumulation of any substance that would prevent their proper operation and shall have a grade level access.

3. All materials shall meet applicable *American Society for Testing and Materials (ASTM)* standards and be resistant to common household chemicals. The drip tubing manufacturer must certify drip tubing as designed and manufactured for the disposal of wastewater. The drip tubing must be color coded, by the manufacturer, to be easily identified as tubing designed for wastewater disposal.

4. Equipment susceptible to freezing must be adequately protected.

106 **DOCUMENTATION**

106.01 Installation Manual

1. The drip manufacturer must provide for registration, detailed instructions for installation, initiation of service and operation and maintenance to the

distributor, installer and Division of On-site Wastewater. Specific instructions shall include but not limited to:

a. Recommendations concerning types of wastewater which cannot be disposed of by the system.

b. Arrangement of plumbing connections.

c. Electrical wiring of components.

d. Installation instructions that specifies how to locate the system in well drained areas that also provides protection for vents, pumps, filters and controls from snow, ice, or water vapor accumulations.

e. A drawing with each major component numbered, and identified with the same designation on an illustration, photograph, or print.

f. Recommended frequency of maintenance; maintenance instructions; and procedures for removal and disposal of wastes.

106.02 Homeowner's Manual

1. A Homeowner's manual shall be provided to the consumer by the drip tubing and advanced treatment unit manufacturers with each Subsurface Drip Irrigation system. The manual shall include:

a. Model number.

b. Design and flow diagrams.

c. Limited warranties.

d. Replacement and service policies.

e. General installation instructions that specifies how to locate the system in well-drained areas that also provides protection for vents, pumps, filters, and controls from snow, ice, or water vapor accumulations.

f. Detailed operation and maintenance requirements (including consumer responsibility, parts, and service).

g. Recommendations concerning types of wastewater which cannot be disposed of by the system.

h. Arrangement of plumbing connections.

i. Electrical wiring of components.

106.03 Limited Warranty

1. The manufacturer shall provide a 2 year limited warranty, from date of installation, covering all parts and materials.

2. Each manufacturer shall furnish the consumer with a limited warranty identifying the replacement policy covering all mechanical and electrical component parts.

106.04 Initial Service Policy

1. A 2 year initial service policy shall be furnished to the consumer by the manufacturer, and shall be included in the original purchase price. This policy shall provide as a minimum:

   a. The 4 inspection/service calls (at least one every 6 months) over the 2 year period including inspection, adjustment, and servicing of mechanical, electrical, and other applicable component parts to insure proper function. The first inspection shall be conducted a minimum of 6 months from installation.

2. If any improper operation is observed, which cannot be corrected at the time of the service call, the consumer and the Department shall be notified immediately in writing of the conditions and the estimated date of correction.

106.05 Continuing Maintenance Agreement

A continuing maintenance agreement, in perpetuity, is required on Subsurface Drip Irrigation Systems. Property owner must submit an Affidavit (Maintenance) and a copy of the current continuing maintenance agreement before system is approved or re-approved as an existing system.

106.06 Stand-by Parts

Standby mechanical and electrical component parts shall be stocked by the local distributor for use when the drip system's mechanical or electrical components must be removed from the installation site for repairs.

106.07 Guaranteed Parts

The physical, mechanical and electrical component parts shall be guaranteed against any defects in material and workmanship as warranted. The cost of replacing damaged component parts, not due to reasonable wear and tear, is excluded from this provision.

106.08 Mechanical Parts

1. Mechanical parts shall be protected against damage or impairment of efficiency by flooding or surcharging.

2. Mechanical parts shall not require periodic maintenance or adjustment by the consumer other than changing a fuse and similar devices, or visual inspection of the warning light.

3. Mechanical parts shall be covered by the manufacturer's limited warranty.

106.09 Service

Service shall be available within no more than 2 days following a request.

106.10 Service Label

A clearly visible, permanently attached label or plate, giving instructions for obtaining service, shall be placed at the audible signal.

107 RESPONSIBILITY

The consumer shall be responsible for maintaining and operating the Subsurface Drip Irrigation System in accordance with the Regulations Governing Individual On-site Wastewater Disposal Systems, Appendixes, advanced treatment system manufacturer’s specifications and the drip tubing manufacturer's specifications.

108 EXISTING SYSTEM

In addition to the visual inspection conducted by the Environmentalist the following will apply:

108.01 The system must be inspected by a Certified Installer that is manufacturer’s authorized representative to verify that the Subsurface Drip Irrigation System is functioning.

108.02 The manufacturer’s authorized representative must furnish written verification, to the Department, that an inspection was made.

Figure I SUBSURFACE DRIP IRRIGATION SYSTEM

(Example sketch only)

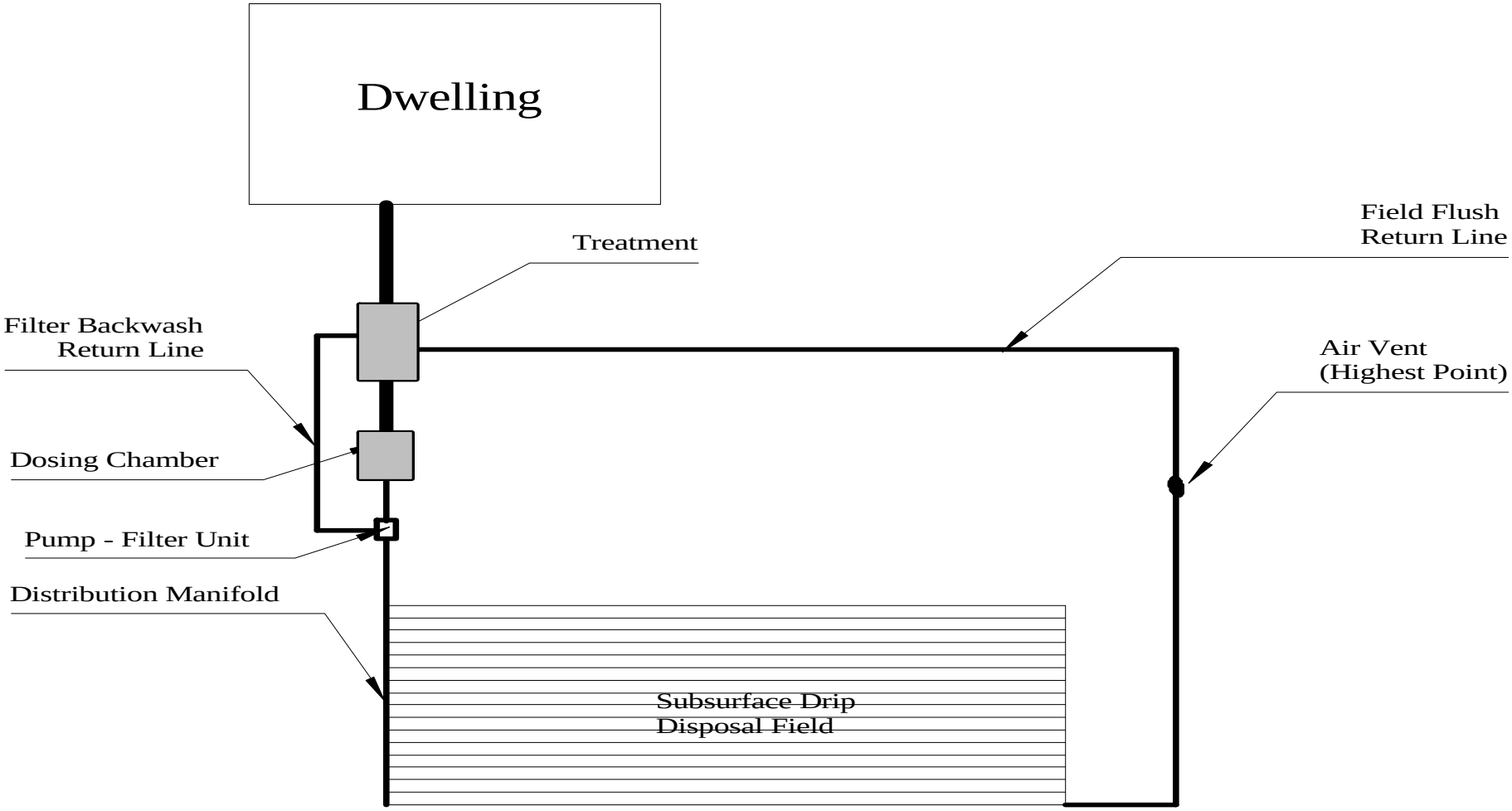

Table I

SUBSURFACE DRIP IRRIGATION SYSTEM

Results of Soil Evaluation

Soil Textural Class	Loading Rate GPD/ Ft^2	Linear feet (Lf) Per Bedroom**	Additional Lf/Person Over 2 Person Per Bedroom**	Depth of Drip Line in Inches
Gravel	NOT SUITABLE			
Coarse Sand Medium Sand Fine Sand Loamy Sand	0.5	150	75	6-18
Sandy Loam Light Loam Heavy Loam Silt Loam Sandy Clay Loam	0.3	250	125	
Light Clay Loam Heavy Clay Loam Light Silty Clay Loam Heavy Silty Clay Loam Sandy Clay	0.15	500	250	
Silty Clay Clay	0.05	1500	750	

The texture of the subsoil material having the slowest permeability rates within 2 feet below the surface receiving effluent shall be used to size the disposal field.

** Bedrooms are equivalent to 150 gallons per day.

Table II

SETBACK REQUIREMENTS FROM SENSITIVE WATER

Minimum Distance from the Water Edge

Soil Textural Class	Slope of Less Than 8 Percent	Slope of Greater Than 8 Percent
Gravel	NOT APPLICABLE	
Coarse Sand Medium Sand Fine Sand Loamy Sand Sandy Loam	100 feet	100 feet
Light Loam Heavy Loam Silt Loam Sandy Clay Loam Light Clay Loam Heavy Clay Loam Light Silty Clay Loam Heavy Silty Clay Loam	50 feet	
Sandy Clay Silty Clay Clay	100 feet	

The texture of the subsoil material having the slowest permeability rates within 2 feet below the surface receiving effluent shall be used to determine setback.

Table III

SUBSURFACE DRIP IRRIGATION SYSTEM PUMP CYCLES

Minimum Requirements

Pump Cycles/24 Hours	Gallons Pumped/Bedroom/Cycle	Additional Gallons Pumped Per Person Over 2 Per Bedroom
6	25	12.5
8	18.75	9.375
10	15	7.5
12	12.5	6.25

Bedrooms are equivalent to 150 gallons per day.

.

This page is intentionally left blank.